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(54) COMMUNICATION MACHINE CONFIGURATION HAVING LOW INTERMEDIATE FREQUENCY (LowIF) FUNCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To overcome the problem wherein a transmission station generation oscillator and a reception station generation oscillator used for a transmitter require different oscillators by different oscillation frequencies in a communication apparatus using a Low IF system for a communication system in a communication apparatus having an OFDM modulation/demodulation functionand each local oscillation oscillator needs to be shielded to reduce the interference noise of each oscillator to be generated.
SOLUTION: The configuration of transmission and reception local oscillators is shared by using a transmission signal that is modulated by a Low IF frequency in advance and using an image rejection configuration as the configuration of the modulator of a transmitter.

CLAIMS

[Claim(s)]
[Claim 1]Composition of a transmitter constituting a transmitter from an office and an oscillator from an office of a receiver mixer which are used for a modulator in composition of a transmitter which has an image rejection function using the same oscillator as a receiving mixer function using OFDM (Frequency Division Multiplexing) modulator and demodulator.
[Claim 2]Composition of a transmitter using a signal beforehand modulated with a low intermediate frequency (Low IF) in a modulating signal inputted into these

mixer circuits in mixer circuits used for a modulator of the 1st paragraph of an application-for-patent paragraph.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field belonging to an invention] In the composition of the transmitter of the time division multiplexing using the same low intermediate frequencythis invention relates to the composition of the transmitter using the oscillating circuit same to the oscillator from an office of a transmitter-receiver.
[0002]
[Description of the Prior Art]Conventionallyin the composition using the image rejection function as a receiverthe frequency from a receiving station of the receiving mixer was set as the frequency of the difference of a low intermediate frequency (Low IF:f_c) and carrier reception frequency. On the other handfrequency conversion of the transmitted oscillating frequency used for the oscillator of a transmitter needed to be carried out using the oscillator by an intermediate frequencyusing a carrier frequency as it is. This intermediate frequency differs from this low intermediate frequency. For this reasonthe received local frequency of the receiver had to differ from the local frequency of the transmitterand it had to have two oscillators in the transmitter whose number is one. For this reasonthe number of parts of the transmitter increased and composition became complicated. The composition of the transmitter in a Prior art is shown in drawing 1. The received signal is amplified with the preamplifier 1-2 via the switch of 1-1. The output of an amplifier is divided into two channelsa rectangular channel and a channel in phaseand it restores to the signal of a rectangular channel by the mixer circuits 1-4. the oscillating frequency of the oscillator 1-9 from an office at this time -- a carrier frequency -- a part for a low intermediate frequency -- it oscillates on low frequency. Similarlyit restores to a channel in phase via the mixer circuits 1-5 using the signal of the local dispatch frequency in phase which shifted the phase of the signal oscillated from the oscillator 1-9 from an office 90 degrees. The phase of the signal is shifted 90 degrees via the phase machine 1-6and it compounds with the demodulation signal of a rectangular channel. An input signal is acquired for the compound signal via the band-pass filter 1-7 and the amplifier 1-8. On the other handa sending signal is modulated by an inphase and the rectangular mixer circuits 1-11and 1-12. The oscillating frequency of this transmitter from an office is equal to modulated carrier frequencyand is oscillated with the oscillator 1-10 from a transmitting station. Here1-13 shows a phase machine 90 degrees. The oscillation carrier frequency is the same as transmission carrier frequency. An inphase and a rectangular modulating signal are compounded and are inputted into the power amplifier 1-16 via the amplifier 1-14 and the bandpass filter 1-15. The amplified signal is transmitted as a transmit modulation

signal through the switch 1-1. In drawing 1the transmitter showed the abnormal conditions by a direct conversion systemand a receiver with the demodulator composition which used LowIF. For this reasonthe conventional transmitter differed in the local oscillating frequency of each transmitter from an office of a transmitter-receiverand needed to use two oscillators from an office. Among **** and a figureplease understand what is only shown roughly to such an extent that the size of each blockshapeand the arrangement relationship can understand this invention. The imaged figure on the frequency axis of the modulating signal in a Prior art is shown in drawing 2. The spectral characteristics of the signal showed the spectrum of the OFDM signal. Hereit explains using a direct conversion system. The output signal from baseband is outputted using a D/A converter. The frequency spectrum of the signal on the frequency axis of an output signal was shown in 2-1. The composition of the modulator uses direct conversion.
[0003]
[Problem(s) to be Solved by the Invention]In the composition of the transmitter which adopted the modulation method using the modulation method by a direct conversion systemor an intermediate frequencyand adopted the demodulation method using Low IF by the receiver in the transmitting sideSince the oscillating frequency of the local oscillator used for the transmitter-receiver concerned differedtwo frequency oscillators from the office of a transmitter-receiver had to be used. For this reasonproblem ****** of having the oscillator in which oscillating frequency differed in two lines and the same transmitterand mutual oscillating frequency interfering each other. In order to avoid interference disturbancethe mutual oscillator needed to be covered thoroughly. for this reason -- the shield part for carrying out full cover of the oscillator becomes large -- a mounting top -- ** -- big circuitry was needed and technical problemslike circuitry becomes complicated occurred. The issue which it is going to solve in this invention is clarifying about the composition which does not produce interference between transmitter-receivers by using for a transmitter the oscillator from an office of the receiver which used the Low IF functionand the same oscillator from an office.
[0004]
[Means for Solving the Problem]In this inventionit becomes irregular by using the same Low IF frequency for a transmitter and a receiver by using an oscillator which has the same dispatch frequency from an office also as a transmitter-receiver. It enables them for the transmitting side and a receiver to be able to set up local oscillating frequency identicallyand to set a local frequency oscillator to one by applying a signal inputted into a mixer of a modulator by a baseband partapplying abnormal conditions with Low IF frequency beforehandand making it a modulating signal. Drawing 3 shows composition of an image rejection mixer when local oscillating frequency of the transmitter 3-3 from an office is set as frequency which subtracted Low IF frequency from a carrier frequency. An input modulating signal uses a signal beforehand modulated by Low-IF frequency by baseband. This modulated input modulating signal is divided into an inphase and a quadrature component. A phase of one of the two's channel is shifted 90 degrees

with the phase machine 3-4and the product of each signal is carried out by the mixer circuits 3-1 of an inphase and a rectangular channeland 3-2 on frequency of a difference of a carrier frequency and LowIF frequency. The frequency concerned is oscillated with an oscillator from an office of 3-3. Frequency oscillated with this oscillator from an office uses frequency which made only Low-IF frequency lower than actual transmission carrier frequency. Here3-5 shows a 90-degree phase machine for making local dispatch frequency which intersected perpendicularly. Each mixer output is compounded using the composing device 3-6. A transmit modulation signal modulated by carrier frequency by this can be acquired. The characteristic on a frequency axis of a spectrum after an inputting [into a transmission mixer when Low IF is used for the transmitting side] baseband signaland a transmission mixer output was shown in drawing 4. Spectral characteristics showed an OFDM signal like drawing 2. Since a spectrum before a transmission mixer input has applied abnormal conditions with Low IF frequency by a baseband partcenter frequency of a spectrum serves as Low IF. An image component occurs by applying abnormal conditions again with a transmission mixer [modulating signal / from the baseband part] using local oscillating frequency. An image component can be oppressed by shifting a phase of one of the two's channel 90 degreesand compounding a mutual channel. In spectral characteristics after frequency conversion of drawing 4the spectral characteristics of an image component showed a repressed situation by an arrow of an one-point dashed line. Thereforein drawing 4a modulating signal centering on the carrier frequency fc can be acquired. A spectrum when a Low IF method is used for the transmitting side is shown in drawing 5. Local oscillating frequency at the time of using a Low IF method is the frequency by Low IF frequency lower than a carrier frequency (f_c-Low IF). Frequency spectrum of an image is turned up focusing on frequency by Low IF frequency lower than this carrier frequency. Oppression of an image component can be performed by shifting a phase of one of the two's channel 90 degreesand compounding it. This suppression quantity was shown as an image rejection in a figure. In order to take a large value of image rejectionit is necessary to make small dispersion in amplitude value of an inphase and a quadrature componentand it is necessary to use a high-precision 90-degree phase machine. In a figuretransmission power shows electric power per 100 kHz. Heretotal transmission power expresses comprehensive electric power of all the transmission bands. The magnitude of attenuation of a frequency (f_c-Low IF) ingredient by Low IF frequency lower than a carrier frequency serves as a carrier leak to total transmission power.

[0005]

[Embodiment of the Invention]This invention is applied to the high frequency circuit section and the transmitting baseband circuit unit of a transmitter-receiver of a wireless LAN communication apparatus which used the OFDM modulation machine. When the receiver of wireless LAN using the OFDM modulator and demodulator method of this invention receives using Low IFLow IF frequency is performed on the frequency of the half of an OFDM modulation zone. For

examplewhen an OFDM frequency band is 20 MHzLow IF frequency is set as 10 MHz. If a carrier frequency sets to 5 GHzthe dispatch frequency from an office will be set as 4.990 GHz. The signal which occurred in baseband and was modulated with the Low IF frequency of 10 MHz inputs the OFDM signal of the transmitting side into the modulation circuit of a high frequency circuit. An input signal is divided into a rectangular cross and an in-phase signaland after it shifts phase of one of the two 90 degreesquadrature modulation of it is carried out. Dispatch frequency is performed at the same 4.990 MHz as reception using the transmitter in which dispatch **** from an office of this modulator of the transmitter from an office of a receiver is the same. This composition can constitute a sending signal from the carrier frequency of 5GH.

[0006]

[Example]The block diagram of the transmitter of this invention and a receiver is shown in drawing 6. Unlike a direct conversion systema transmitter adopts a Low IF method as a modulation method. Operation of a receiver is the same as explanation of drawing 1. In the transmitting sidethe signal beforehand modulated on the same frequency as Low IF frequency is used for a sending signal. Abnormal conditions use the signal beforehand modulated by baseband. It becomes irregular to an inphase and rectangular channel signaling using the mixer circuits 6-10 and 6-11 using the frequency oscillated from the local oscillator 6-9 to the signal modulated by Low IF. Since an image component appears in the output of a transmission mixerit is necessary to remove an image component using an image rejection mixer in the mixer of the transmitting side as well as a receiver. For this reasonthe phase of one of the two's channel is shifted 90 degrees with the phase machine 6-14and it inputs into each mixer. The compounded signal is transmitted through the switch 6-1 via the amplifier 6-15the bandpass filter 6-16and the power amplifier 6-17 as a transmit modulation signal. In this inventioneven if it constitutes the sending signal of a baseband signal as an inphase and a quadrature component beforehandthe same composition is realizable. Among **** and a figureplease understand what is only shown roughly to such an extent that the size of each blockshapeand the arrangement relationship can understand this invention. Although the transmitting baseband signal was divided into the in phase channel and rectangular cross channel with the phase machine 90 degrees and composition explained it in this examplethe composition using the signal which divided the baseband signal into the in phase channel and rectangular cross channel beforehand is also the range of this invention.

[0007]

[Effect of the Invention]In the composition of the conventional transmitter which used the quadrature modulation machine for the transmittertwo oscillators from an office in which frequency differs had to be conventionally used for the transmitter-receiver using the receiver using a Low IF method. When the transmitting side by this invention also becomes irregular using the LowIF (low intermediate frequency) function which uses the same intermediate frequency as a receiverthe transmitter from an office of transmission and reception can be

communalizedthe number of parts reducesand it becomes possible to simplify composition. It enables this to prevent the secondary harmonics from a voltage controlled oscillator (VCO:Voltage controlled oscillator) or amplifier from blocking a received input. With the conventional compositionsince two transmitters from an office which send thing oscillating frequency with high frequency were required of the transmitter-receiverit was required to prevent mutual frequency from interfering. It is not necessary to cover with one transmitter from an office in this invention by removing interference of a mutual signal from it being applicable to the transmitter from an office of a transmitter-receiver. In the formersince two PLL of high frequency was requiredpower consumption became largebut it becomes possible to stop power consumption by using one line.
[0008]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The lineblock diagram of the transmitter in a Prior art
[Drawing 2]The spectrum figure on the frequency axis of the modulating signal in a Prior art
[Drawing 3]The lineblock diagram of the transmitter in this invention
[Drawing 4]The spectral-characteristics figure of the abnormal-conditions function in an invention
[Drawing 5]The spectrum figure in a transmitting side mixer output
[Drawing 6]The example of this invention
[Description of Notations]
The explanations of letters or numerals used for each drawing are shown below.
Explanations of letters or numerals of drawing 1
A transmit/receive switch1-2 : 1-1: An amplifiera 1 to 3:90-degree phase machine1-41-5 : A multipliera 1 to 6:90-degree phase machinea 1-7:bandpass filter1-8: An amplifierthe transmitter from a 1-9:receiving stationthe transmitter from a 1-10:transmitting stationa 1-111-12:multipliera 1 to 13:90-degree phase machinea 1-14:amplifiera 1-15:bandpass filter1-16 : amplifier
Explanations of letters or numerals of drawing 2
2-1: A baseband sending-signal spectrum2-2 : abnormal-conditions sending-signal spectrum
Explanation of the sign of drawing 3
3-13-2: A multiplierthe transmitter from a 3-3:transmitting stationa 3 to 4:90-degree phase machinea 3 to 5:90-degree phase machine
Explanations of letters or numerals of drawing 6
Transmit/receive switch6-2:amplifierand 6-36-4 : 6-1: A multiplierA 90-degree phase machinea 6 to 6:90-degree phase machine6-7 : 6-5: A bandpass filter6-8: An amplifierthe transmitter from a 6-9:transceiver officea 6-106-11:multipliera 6 to 13:90-degree phase machinea 6 to 14:90-degree phase machinea 6-

15:amplifiera 6-16:bandpass filter6-17 : amplifier